ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 1.852

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

INTELLEGENT APPROACH FOR OFFLINE SIGNATURE VERIFICATION USING CHAINCODE AND ENERGY FEATURE EXTRACTION ON MULTICORE PROCESSOR

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ABSTRACT

The signature of a person is an important biometric attribute of a human being which can be used to authenticate human identification. A number of biometric techniques have been proposed for personal identification in the past. Among the vision-based ones are voice recognition, iris scanning and retina scanning, fingerprint recognition, face recognition. Signature verification are the most widely known among the non-vision based ones. As signatures continue to play a very important role in financial, legal transactions and commercial, in truly secured authentication becomes more and more crucial. However human signatures can be handled as an image and recognized using computer vision and neural network techniques. There are various approaches to signature recognition with a lot of scope of research. In this paper consists of image prepossessing, parallel process, feature extraction, verification and neural network training with extracted features. A verification stage includes applying the extracted features of test signature to a trained neural network which will classify it as a genuine or forged. In this paper, offline signature recognition & verification using neural network is proposed. Signatures are verified based on parameters extracted from the signature using parallel processing techniques.

Keywords:, Neural network, feature extraction, chain code, etc.

INTRODUCTION

The need to ensure that only the right people have authorization to high security accesses has led to the development of systems for automatic personal verification. Signatures, fingerprints, palm prints, voice, and handwriting have all been used to verify the declared identity of an individual. Among all, signature has a fundamental advantage in that it is the customary way of identifying an individual in daily operations such as automated banking transaction, electronic fund transfers, document analysis, and access control.

A signature may be termed a behavioral biometric, it can modify depending on many essentials such as: frame of mind, exhaustion. The exigent aspects of automated signature recognition and verification have been, for a long time, a true impetus for researchers. The research into signature verification has been energetically pursued for a number of years and is still being explore. Signature recognition and verification involves two separate but strongly related tasks in one of them is identification of the signature owner, the other is the decision about whether the signature is genuine or forged.

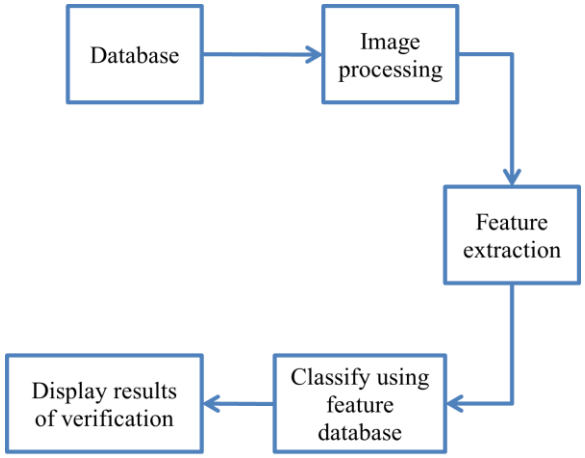

Fig: 1 Signature verification process

A signature verification system must be able to detect forgeries and at the same time reduce rejection of genuine signatures varification. The signature verification problem can be classified into categories of offline and online system. Offline signature verification does not use dynamic information that is

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used extensively in online signature verification systems. In this paper, we investigate the problem of offline signature verification.

AREAS OF SIGNATURE RECOGNITION

As already mentioned, Signature recognition is a technique by which a computer system can recognize signatures and other symbols written by hand in natural Signature recognition. At the highest level, Signature recognition can be broken into two categories on the basis of how the raw data is acquired it is also classified whether text is machine printed or hand written. The hand written Signature Recognition Problems also called as HCR problem [2]. Therefore, on the basis of raw data acquisition and the nature of Signature data, in Signature recognition is divided into two distinct areas as follows:

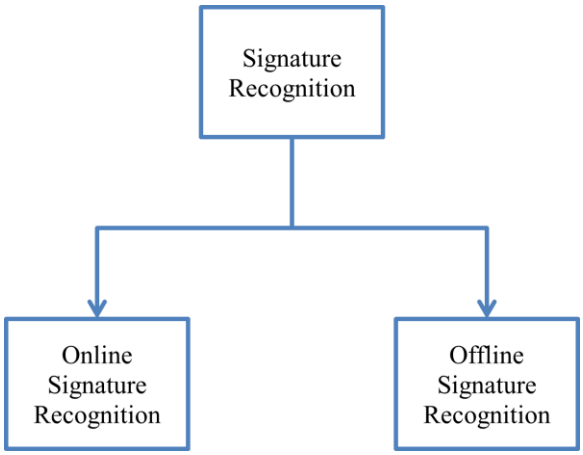

Fig: 2 Areas of Signature recognition

Offline Signature Recognition

In this type of recognition, the text is not recognized at the same time as it is produced but after the user has finished writing. in this case, the text is originally written on a surface such as paper and from there on it is recognized by the computer by scanning the surface. In the scanned Signature is first stored digitally in grey scale format. bitmap image, and then further processing is done on it to have a good recognition accuracy.

Features for recognition are enhanced and extracted from the stored bitmap image by using digital image processing. Offline signature recognition is known as Optical Signature Recognition (OCR), because the image of writing is converted into bit pattern by an optically digitizing device such as optical camera or scanner. The recognition is done on this bit pattern data for machine-printed or hand-written text [3]. Recognition of machine printed signatures is also a part of Optical Signature Recognition. In offline methods are less suitable for man-machine communication because no real time interactivity is present. It is suitable for automatic conversion of paper documents to electric documents which then may be interpreted by computers. Some applications of the off-line recognition are large-scale data processing such as postal address reading; check sorting, office automation for text entry automatic inspection and identification [11].

Online Signature Recognition

In contrast to the offline method of Signature recognition, the online Signature recognition is done in real time. at the same time as the Signature is produced. It is surface are used for Signature is usually a digitized tablet and it is used along with a digital pen also sometimes called "Stylus", in order to write on the surface. The pen moves across the surface area, the two-dimensional co-ordinates of successive points are collected and stored as a function of time as shown in Figure 3.

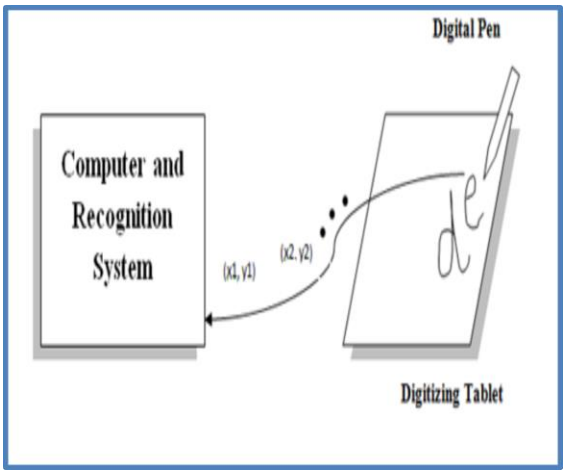

Fig: 3 A tablet digitizer, input sampling and communication to the Computer

Machine-printed text includes the materials such as books, magazines, newspapers, documents and various writing units in the video or still image.

PARALLEL COMPUTATIONS

Image processing can be done on a multiprocessor architecture where each part of the image is being worked upon independent of the other image. This is usually performed on images where the transformation function applied supports the division of the image. The our case, the signature recognition algorithm supports that the image be divided into two

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halve. We used two core of comuputer and performed the operation on both core. A image feature extraction task running concurrently on twoworkers that may communicate with each other. On the serial computing , this results in one batch job with multiple processors running in parallel. The data-parallel job is used in this project.

CHAIN CODE (CC)

Shape approximation technique in feature extraction stage, particularly chain code has been widely used to encode the boundary line because of its simplicity and low storage requirement [5]. Chain Code representation gives the boundary of signature image where the codes represent the direction of where is the location of the next pixel from current point.

Chain codes are used to represent a boundary by a connected sequence of straight-line segments of specified length and direction. The direction of each segment is coded by using a numbering scheme such as the ones shown in Figure 4.

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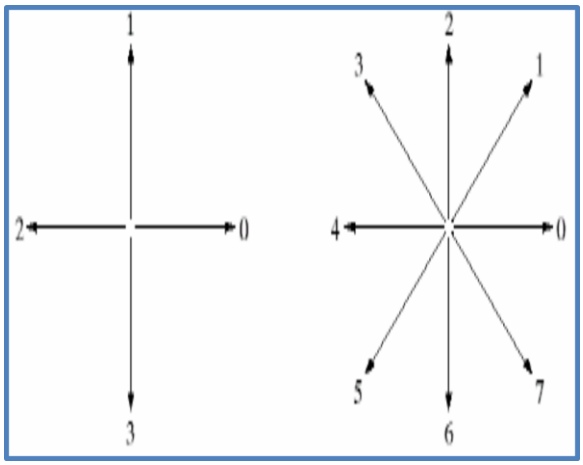

Fig: 4 Direction and 8-direction chain code

The method generally is unacceptable for two principal reasons:

- The resulting chain of codes tends to be quite ling and,
- In any small disturbances along the boundary due to noise or imperfect segmentation cause changes in the code that may not be related to the shape of the boundary.

An approach frequently used to circumvent the problem just discussed is to resample the boundary by selecting a larger grid spacing, as illustrated in Figure 5.

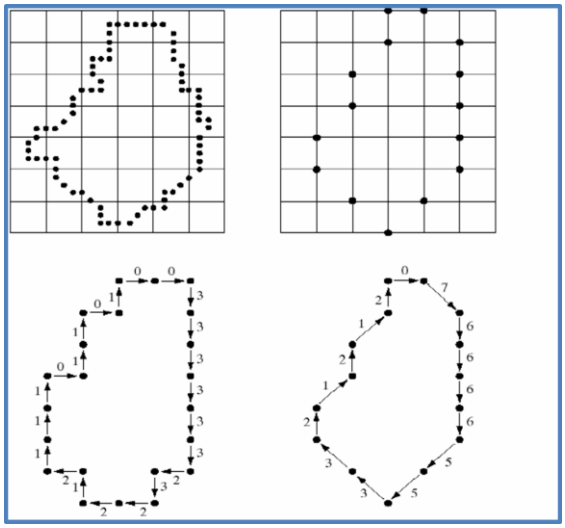

Fig: 5 Concept Object boundary

PROPOSED METHODOLOGY

To perform verification or identification of a signature, several steps must be performed.

A. Image pre-processing
B. Feature extraction
C. Neural network training

*A. **Image Pre-Processing***

Image pre-processing represents a wide range of techniques that exist for the manipulation and modification of images. It is the first step in signature verification and recognition. In a successful implementation of this step produces improved results and higher accuracy rates.

*B. **Feature Extraction***

Feature extraction is the second major step in signature recognition and verification. If we are to compare 2 sketches; there should be at least one measurement on which to base this comparison. It is main function of this step is to generate features which can be used as comparison measurements. Since the issue of signature verification is a highly sensitive process, more than one feature/measurement has to be generated in order to enhance the accuracy of the result.

*C. **Neural Network Training***

Neural networks- like human beings - depend on the idea of learning in order to achieve any task. They learn through training on a large number of data, which enables them to create a pattern with time, that they will use later. They are very helpful in detecting patterns that are complicated and hard to derive by humans or by simple techniques. Just like the case of signature recognition, it is very hard to tell whether a

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signature is original or forged, especially if it is carried out by a skilled forger. Thus a more advanced technique to detect the differences is needed to achieve a decision on its authenticity. Neural networks do not follow a set of instructions, an provided for them by the author, but they learn as they go case by case.

SIGNATURE RECOGNITION AND VERIFICATION USING ANN

Neural networks are highly reliable when trained using a large amount of data. They are used in applications where security is highly valued. For signature recognition and verification several steps must be performed. In our proposed work basically we collect the scanned images of signature of different persons, basically we collect the 10 scanned images of individuals' actual signatures and there forged signatures. These images are stored in a database which we are going to use in training & testing of ANN, In our proposed work we have to use an interface with scanner for getting an image and These images are stored in a database. After preprocessing all signatures images from the database, features extraction will be used to extract various features of signature such as stroke, moment invariants, GLCM, color dominant, histogram that can distinguish signatures of different persons. These are used for training and testing of neural network.

The proposed methodology or procedure for signature recognition and verification are as follows:

- Acquire the Signature images (load data).
- Image preprocessing.
- Select methods, normal, parallel.
- Extract the various features.
- The tanning processing.
- The final result show in the graph.

RESULTS AND DISCUSSION

Three performance parameters have been used in this project to evaluate the classifier namely FAR, FRR and recognition rate. The energy feature, chin code and mixed feature are used in thois project with single core and multicore operation. The time required for feature extraction is given below,

Type of feature	No. of images	Single core time	Multicore time
Energy	50	8.1 sec	3.6 sec
Chain code	50	22.3 sec	9.6 sec
Mixed	50	29.3 sec	13.4 sec

The result of the classifier for energy feature, chin code and mixed feature are shown in the figure below

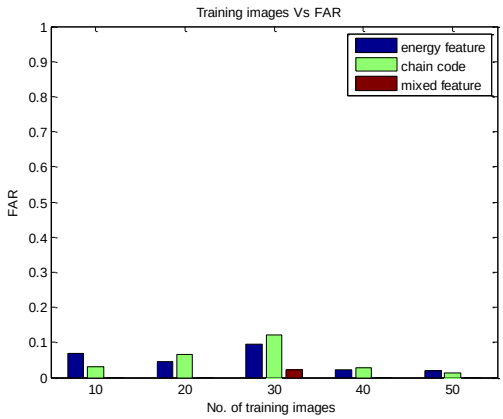

Fig: 6 Recognition rate of classifier

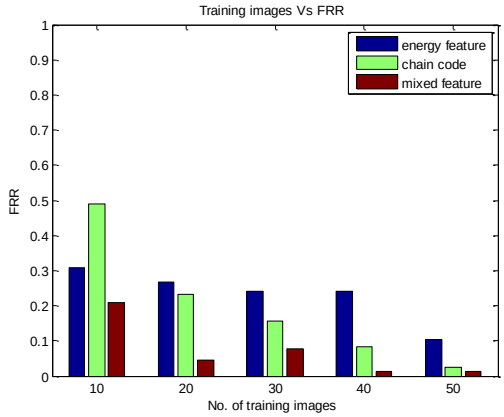

Fig: 7 Recognition rate of classifier .

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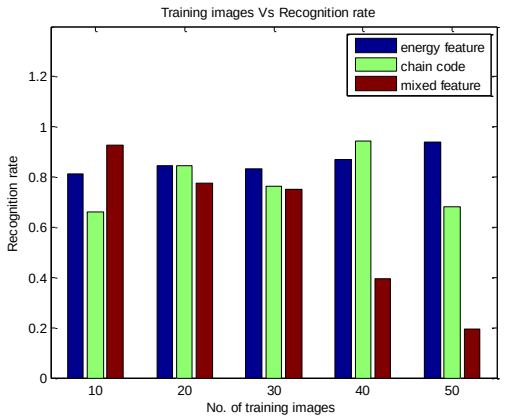

Fig: 8 Recognition rate of classifier

CONCLUSION

The feature extrcation time for the feature extraction is significantly reduce with the multicore processor. The recognization process will provide a satisfactorily result with the different no. of training image. Due to handwritten images there are mismatch in the images and it is rejected by the classifier hence having higher FRR but low FAR .

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